MAI-2006-24

UNITED STATES
DEPARTMENT OF LABOR
MINE SAFETY AND HEALTH ADMINISTRATION
Metal and Nonmetal Mine Safety and Health

REPORT OF INVESTIGATION

Surface Nonmetal Mine
(Sand and Gravel)

Fatal Falling Material Accident
November 10, 2006

Seppi Brothers Concrete Products Corporation
Jammer Lake Pit - Virginia
Virginia, St. Louis County, Minnesota
Mine I.D. No. 21-00880

Investigators

George F. Schorr
Supervisory Special Investigator

Gerald Pifer, P.E.
Civil Engineer

Originating Office
Mine Safety and Health Administration
North Central District
515 West First Street, Room 333
Duluth, MN 55802-1302
Steven M. Richetta, District Manager


LORAIN

OVERVIEW

Christopher M. Luecken, loader operator, age 41, was fatally injured on November 10, 2006. He was struck by the head pulley work platform of a mobile radial stacker conveyor when the main truss failed. The failure of the truss caused the conveyor to buckle, allowing the head pulley section to fall to the ground. The conveyor was being prepared for movement to another location when the accident occurred.

The accident occurred because management modified the manufacturer's field conveyor design and compromised the structural integrity of the conveyor. Management did not consult the manufacturer of the conveyor or follow established engineering principles when making the modifications.

GENERAL INFORMATION

Jammer Lake Pit-Virginia, a surface sand and gravel mining operation, owned and operated by Seppi Brothers Concrete Products Corporation, was located in Virginia, St. Louis County, Minnesota. The principal operating official was Matt Seppi, president. The mine was normally operated one, 8-hour shift per day, five days a week. Total employment was two persons.

Sand and gravel was mined from a single bench open pit by front-end-loader and placed into a portable crusher. Material was then screened, washed, and stockpiled to size. Finished products were sold for use in the construction industry.

Mining had ceased at this location on November 9, 2006, and the company was in the process of dismantling sections of the plant for relocation.

The last regular inspection of this mine was completed on October 3, 2005.

DESCRIPTION OF ACCIDENT

On the day of the accident, Christopher M. Luecken (victim), reported for work at 7:00 a.m., his normal starting time. He usually worked at the company's Portable Crusher mine but was assigned to assist with dismantling equipment at the Jammer Lake Pit – Virginia that day. Upon arrival he met with Donald Luecken, foreman and the victim's brother, and Patrick Christensen, equipment operator, to discuss work assignments required to relocate the ¾ - inch rock conveyor.

They first moved the ¾-inch rock conveyor radially, south 10 feet, to level ground with a front-end loader. A torch was used to remove a section of the hopper chute located above the tail pulley end of the conveyor. A crane was used to individually lift the north and south wheel assemblies of the conveyor off the ground to enable the conveyor wheels to be repositioned for towing. Christopher Luecken and Christensen then installed a chain to the conveyor's wheel assembly so the front-end loader could pull the conveyor from the wash plant.

About 8:00 a.m., Donald Luecken used a torch to cut a steel pin that attached the ¾-inch rock conveyor tail pulley to the frame of the wash plant. Prior to completely cutting the pin, Christensen interrupted him to discuss concerns that the chain was too short and that, if the conveyor tipped, the head pulley of the conveyor could strike the front-end-loader's cab. Donald Luecken then asked Christensen and Christopher Luecken to look for additional chains. A short time later Donald Luecken walked to his pick-up truck to check for messages on his cell phone.

About 8:15 a.m., Christensen and Christopher Luecken were working under the conveyor's head pulley work platform installing the extra length of chain, when the truss frame failed, allowing the truss to buckle and the head pulley platform to fall. They

attempted to escape from the falling conveyor but the victim was struck by the head pulley platform.

Donald Luecken heard the conveyor truss fail and returned to find his brother pinned under the head pulley platform. The front-end-loader was used to lift the head pulley work platform off the victim and emergency medical assistance was summoned.

Emergency medical personnel arrived at the scene but could not resuscitate the victim. At 9:05 a.m., he was pronounced dead at the scene by the St. Louis County Medical Examiner's deputy coroner. Death was attributed to multiple traumatic injuries.

INVESTIGATION OF ACCIDENT

MSHA was notified on November 10, 2006, at 10:09 a.m., by a telephone call from the St. Louis County Sheriff's department to MSHA's Hotline. Gerald Holeman, assistant district manager, was called and an investigation began the same day. An order was issued pursuant to Section 103(k) of the Mine Act to ensure the safety of the miners.

MSHA's accident investigation team conducted a physical inspection of the accident site, interviewed employees, and reviewed conditions and work procedures relevant to the accident. MSHA conducted the investigation with the assistance of mine management and employees.

DISCUSSION

Location of the Accident

The accident occurred at the wash plant ¾-inch rock conveyor. The immediate ground had been cleared of processed materials and leveled in preparation to relocate the conveyor. The ground was frozen and firmly packed with rock material.

Conveyor

The Pioneer Knock-Down (KD) 30-inch Super Service (SS) conveyor was originally constructed as a stationary "fixed" conveyor system. Structural support for the original conveyor design was provided by two fixed intermediate vertical bents.

The conveyor sections consisted of two parallel welded-truss frames with diagonal and lateral cross bracing. Each 10-foot-long truss section was bolted to the adjacent truss section using a lateral frame. The conveyor drive was located at the head end of the conveyor. A steel framed platform with a wooden deck provided access to the conveyor drive assembly.

In April 2006, the mine operator modified the stationary "fixed" conveyor to a radial stacking conveyor. Structural steel from the original vertical bents was removed and reused for the construction of a new structural support framework and cradle truck

assembly. The modified conveyor was constructed with a 15-foot-long cantilevered truss section at the head end of the conveyor. Corbel connections along the bottom chords were modified to attach the structural support framework. The tail section of the conveyor was modified to provide a pivoting base plate with a bolted rotating pivot point.

The cradle truck assembly was fabricated using steel beams, structural tubing, and angles. The truck assembly was outfitted with two “manual swivel” pivoting steel wheels and pneumatic tires. The pivoting wheel assembly provided the capability to move the conveyor in either a parallel or perpendicular direction.

The head pulley section of the modified radial stacking conveyor weighed approximately 1,800 pounds and the tail pulley section about 1,100 pounds.

Equipment (Conveyor) Failure Scenario

The modified radial stacker conveyor failed as follows: (see Appendix B)

- Prior to the accident, the wheels of the cradle truck assembly were oriented perpendicular to the conveyor. In this position, sufficient rolling resistance was provided to prevent movement/rotation in the direction away from or toward the pivot point.
- In preparation for moving the conveyor, the pivoting wheel assembly was rotated parallel to the conveyor. This wheel orientation provided little resistance against movement in a direction away from or toward the pivot point.
- The weight associated with the head pulley (1,800 pounds) and the cantilevered portion of the conveyor truss sections located at the head section created a downward force on the front support arm of the cradle truck assembly.
- The head section and cantilevered portion of the conveyor deflected downward due to the configuration of the conveyor structure and loads involved. This movement caused the front support for the “V”-shaped support framework to push downward.
- The wheels allowed the support framework to rotate so the rear support pushed upward.
- The load from the cantilevered portion of the conveyor, including the head pulley, was transmitted into the bottom chord of the conveyor truss.
- The length and location of the corbel connection was not capable of distributing the load sufficiently over the bottom chord of the truss. This caused the bottom chord to buckle.
- As the bottom chord buckled, the top chord became overloaded in tension. As the head end of the conveyor dropped further, this ultimately caused the high strength bolts in the top chord of the truss to fail.
- Once the bottom and top chords of the conveyor truss failed, the head end of the conveyor could no longer be supported and it dropped to the ground.

Weather Conditions

Weather conditions were reported to be cold and clear, with a slight wind. Weather was not considered a factor in the accident.

Training and Experience

Christopher M. Luecken had 4 years and 1 month of mining experience, all at Seppi Brothers Concrete Products Corporation, and had received training in accordance with 30 CFR, Part 46. Two to three times a year, he dismantled and moved mining equipment, including conveyors.

Donald E. Luecken had 8 years and 2 months of mining experience, all at Seppi Brothers Concrete Products Corporation. He had received training in accordance with 30 CFR, Part 46. Two to three times a year, he dismantled and assembled portable crushing equipment, including conveyors.

Patrick R. Christensen had 7 years and 4 months of mining experience, all at Seppi Brothers Concrete Products Corporation. He had received training in accordance with 30 CFR, Part 46. Two to three times a year, he dismantled and assembled portable crushing equipment, including conveyors.

Medical Analysis and Findings

A sample of the victim's urine was analyzed for alcohol and drugs. The drug screen indicated prior use of marijuana. Impairment could not be assessed without observations of the victim's behavior prior to his death.

ROOT CAUSE ANALYSIS

A root cause analysis was conducted and the following root causes were identified:

Root Cause: Management standards and controls were inadequate. The mine operator failed to consult with the manufacturer of the conveyor or follow established engineering principles when making modifications. The modifications completed by the mine operator compromised the structural integrity of the conveyor.

Corrective Action: Management should implement a policy ensuring that modifications to equipment are made by following established engineering principles so hazards to persons are not created.

CONCLUSION

The accident occurred because management failed to recognize that hazards to persons were created when they made modifications to the conveyor. Management did

not consult the manufacturer of the conveyor or follow established engineering principles when making the modifications.

ENFORCEMENT ACTIONS

Order No. 6193005 was issued on October 10, 2006, under the provisions of Section 103(k) of the Mine Act:

> A fatal accident occurred at this operation on November 10, 2006, when a miner was struck by the upper section of the ¾-inch stacker belt when it collapsed. This order was issued to assure the safety of all persons at this operation. It prohibits all activities around the wash plant until MSHA has determined it is safe to resume activity in the area. The mine operator shall obtain prior approval from an authorized representative for all actions to recover and restore operations in the affected area.

The order was terminated on November 27, 2006. Conditions that contributed to the accident no longer exist.

Citation No. 6135221 was issued on December 12, 2006, under the provisions of Section 104(a) of the Mine Act for violation of 30 CFR 56.14205:

> A fatal accident occurred at this mine on November 11, 2006, when a mobile radial stacker conveyor's main truss failed, allowing the head pulley end of the conveyor to fall to the ground, striking a miner who was working below. The mine operator modified this conveyor in April 2006, from its originally manufactured fixed conveyor design to a radial stacker conveyor. This modification resulted in using the equipment beyond the design capacity intended by the manufacturer and created a hazard to persons.

The citation was terminated on January 16 2007. The mine operator removed the mobile radial stacker from further use at the mine.

Approved By: Date:

Steven M. Richetta
District Manager
North Central District

APPENDIX A

Persons Participating in the Investigation

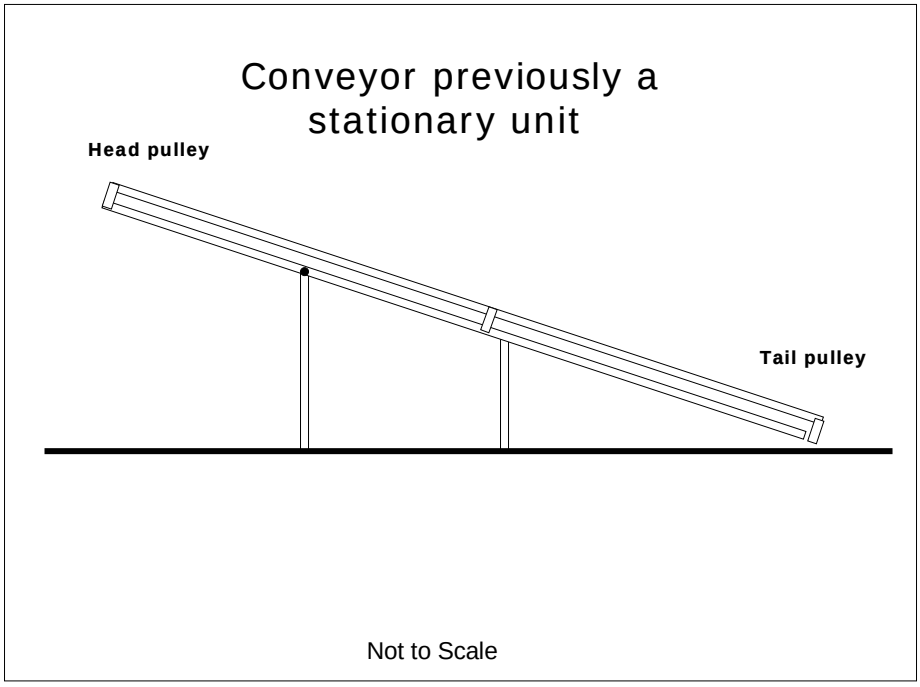
Seppi Brothers Concrete Products Corporation

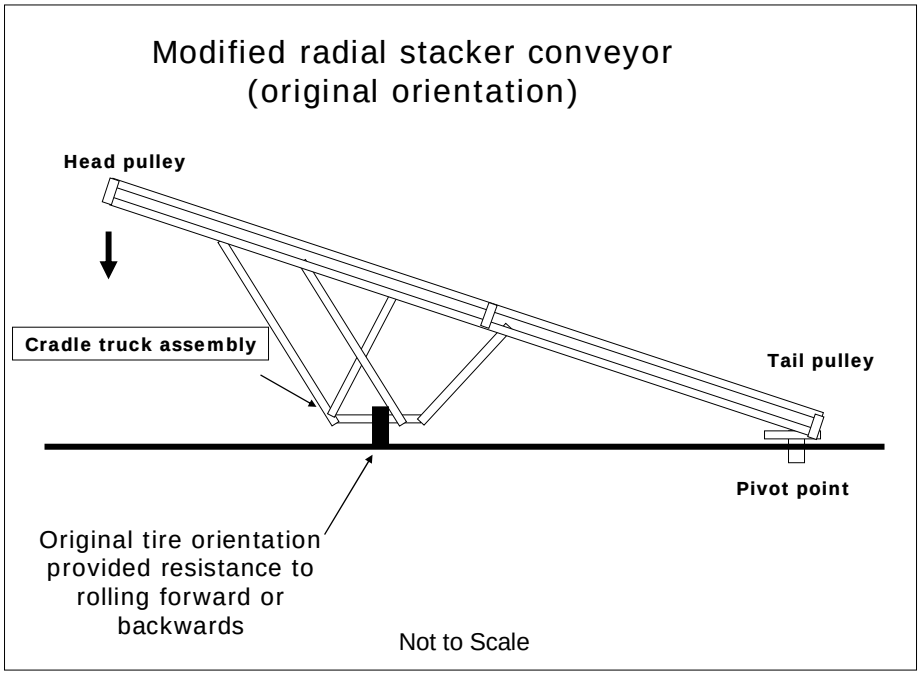
Matt Seppi	president

Mine Safety and Health Administration

George F. Schorr	supervisory special investigator
Gerald Pifer, P.E.	civil engineer

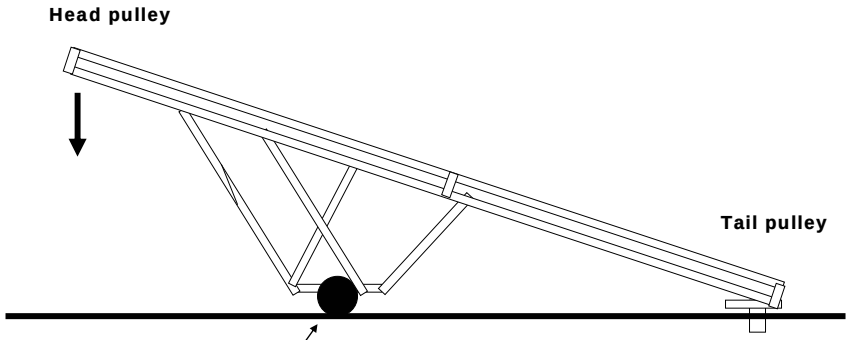
APPENDIX B


Conveyor previously a stationary unit
Head pulley
Tail pulley
Not to Scale


Modified radial stacker conveyor (original orientation)
Head pulley
Cradle truck assembly
Tail pulley
Pivot point
Original tire orientation provided resistance to rolling forward or backwards
Not to Scale

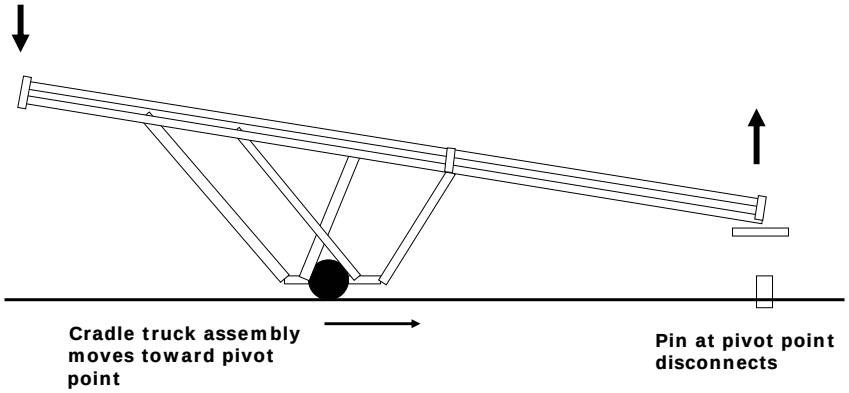
APPENDIX B (cont.)

Modified radial stacker conveyor
(revised orientation)



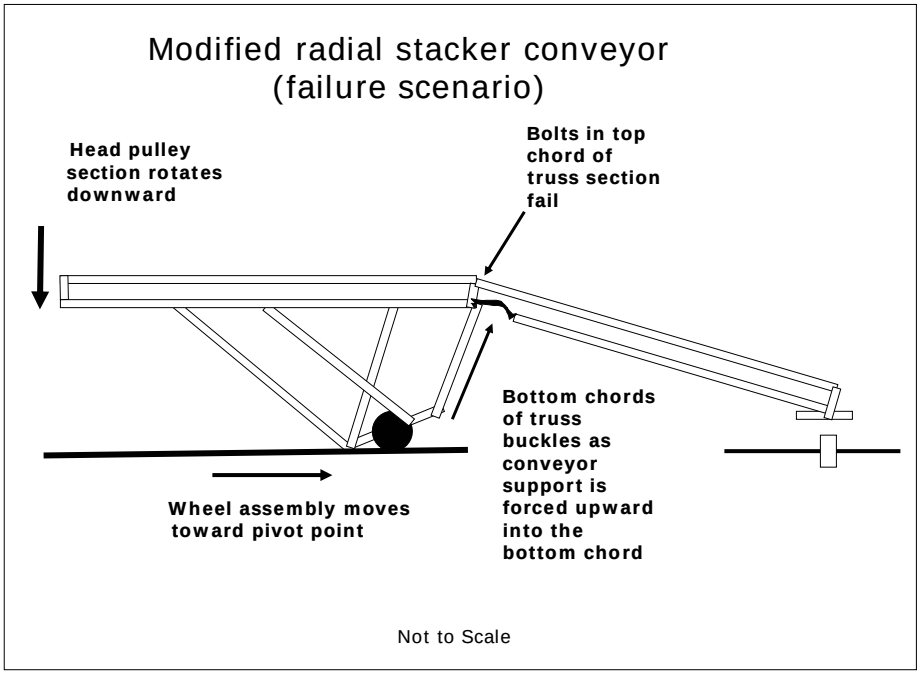
Not to Scale

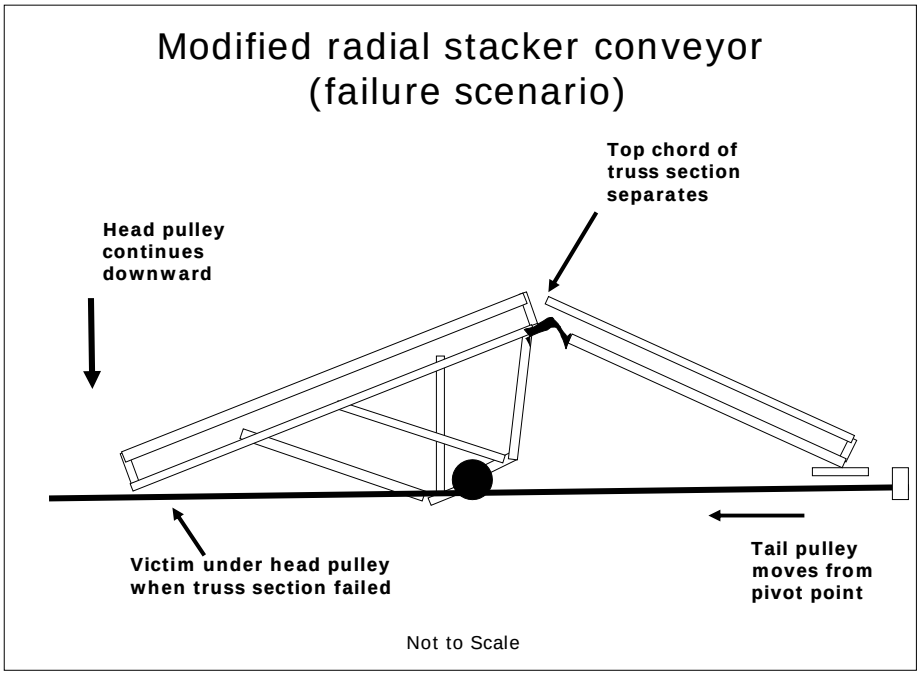
Modified radial stacker conveyor
(begins to rotate counter clockwise)



Not to Scale

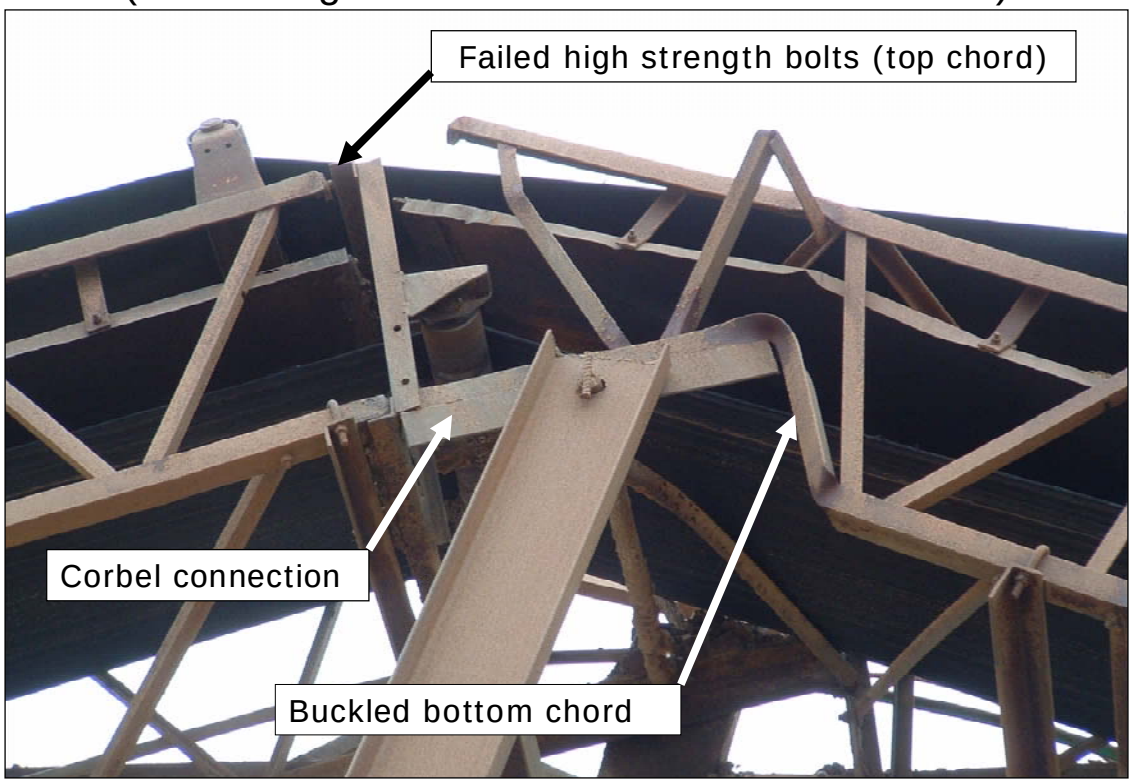
APPENDIX B (cont.)





APPENDIX B (cont.)

Close up of buckled bottom chord of conveyor section
(Note: Length and location of corbel connection)



Accident Investigation Data - Victim Information

Event Number: 0 9 9 1 3 4 4

APPENDIX C

U.S. Department of Labor
Mine Safety and Health Administration

Victim Information: 1

1. Name of Injured/Ill Employee:	2. Sex	3. Victim's Age	4. Last Four Digits of SSN:	5. Degree of Injury:
Christopher M. Luecken	M	41		01 Fatal

6. Date(MM/DD/YY) and Time(24 Hr.) Of Death: a. Date: 11/10/2006 b.Time: 8:15

7. Date and Time Started: a. Date: 11/10/2006 b.Time: 7:00

8. Regular Job Title: 182 Front end loader operator

9. Work Activity when Injured: 041 Moving equipment

10. Was this work activity part of regular job? Yes | No X

11. Experience	Years	Weeks	Days	b. Regular	Years	Weeks	Days	c: This	Years	Weeks	Days	d. Total	Years	Weeks	Days
a. This Work Activity:	0	6	6	Job Title:	4	8	5	Mine:	0	0	1	Mining:	4	8	5

12. What Directly Inflicted Injury or Illness? 035 Conveyor

13. Nature of Injury or Illness: 170 Crushing

14. Training Deficiencies: Hazard: | New/Newly-Employed Experienced Miner: | Annual: | Task: |

15. Company of Employment:(If different from production operator) Operator

Independent Contractor ID: (if applicable)

16. On-site Emergency Medical Treatment: Not Applicable: | First-Aid: | CPR: | EMT: X | Medical Professional: | None: |

17. Part 50 Document Control Number: (form 7000-1)

18. Union Affiliation of Victim: 2501 Int Union Operating Engineers

Victim Information:

1. Name of Injured/Ill Employee:	2. Sex	3. Victim's Age	4. Last Four Digits of SSN:	5. Degree of Injury:

6. Date(MM/DD/YY) and Time(24 Hr.) Of Death:

7. Date and Time Started

8. Regular Job Title:

9. Work Activity when Injured:

10. Was this work activity part of regular job? Yes | No

11. Experience:	Years	Weeks	Days	b. Regular	Years	Weeks	Days	c: This	Years	Week	Days	d. Total	Years	Weeks	Days
a. This Work Activity:				Job Title:				Mine:				Mining:			

12. What Directly Inflicted Injury or Illness?

13.Nature of Injury or Illness:

14. Training Deficiencies: Hazard: | New/Newly-Employed Experienced Miner: | Annual: | Task: |

15. Company of Employment: (If different from production operator)

Independent Contractor ID: (If applicable)

16. On-site Emergency Medical Treatment: Not Applicable: | First-Aid: | CPR: | EMT: | Medical Professional: | None: |

17.Part 50 Document Control Number: (form 7000-1)

18. Union Affiliation of Victim:

Victim Information:

1. Name of Injured/Ill Employee:	2. Sex	3. Victim's Age	4. Last Four Digits of SSN:	5. Degree of Injury:

6. Date(MM/DD/YY) and Time(24 Hr.) Of Death:

7. Date and Time Started:

8. Regular Job Title:

9. Work Activity when Injured:

10. Was this work activity part of regular job? Yes | No

11. Experience:	Years	Weeks	Days	b. Regular	Years	Weeks	Days	c: This	Years	Week	Days	d. Total	Years	Weeks	Days
a. This Work Activity:				Job Title:				Mine:				Mining:			

12. What Directly Inflicted Injury or Illness?

13. Nature of Injury or Illness:

14. Training Deficiencies: Hazard: | New/Newly-Employed Experienced Miner: | Annual: | Task: |

15.Company of Employment:(If different from production operator)

Independent Contractor ID: (If applicable)

16. On-site Emergency Medical Treatment: Not Applicable: | First-Aid: | CPR: | EMT: | Medical Professional: | None: |

17. Part 50 Document Control Number: (form 7000-1)

18. Union Affiliation of Victim: